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USE OF THE HELICOPTER AS A SPOTTING TOOL ON INSECT CONTROL PROJECTS

Rugged terrain covered by deep snow in timbered areas infested by bark beetles is a difficult and costly obstacle to the spotting required for insect control work. This problem was most recently manifested by the proposed spring-1950 Fence Meadow project, Sierra National Forest, set up to control bark beetles in virgin sugar pine and ponderosa pine. Means to overcome this obstacle seemed possible by use of the helicopter as a spotting tool in this 11,200-acre control area.

Discussions between forest officers of the Sierra National Forest and Berkeley Forest Insect Laboratory personnel early in February resulted in the decision to try out an aerial spotting of infested trees in this area by the helicopter. The first part of March was decided as the best time for flights. Bids were let by the Forest Service and plans for the flights were scheduled for the first day of good flight weather during the week of March 13. The successful bidder was Kern-Kopters, Inc., of Bakersfield. This firm was awarded the flight contract.

Detailed plans were drawn up for this type of spotting. Maps of the control area (scale: 4 inches = 1 mile) were prepared from earlier insect control maps of this area. Aerial photos were studied for details of topography, drainages, roads, and any other features of the area that might be used in pin-pointing locations of individual trees. Additional details were provided by placing luminous banner paper markers at section-line and 40-line crossings north and south along the Minkey - Fence Meadow road. The details of this spotting were submitted in a plan dated March 1, 1950.

Actual flights over the control area with a Bell helicopter, Bob Yager as pilot, were undertaken on Monday, March 13, beginning shortly after 9:00 a.m. The first flight was a general reconnaissance of the area to determine from the air any changes in mapping procedure that may not have been anticipated, and to eliminate areas not in need of coverage. Mapping procedure followed in two successive flights, with changes in original plans resulting from the first flight.

The first flight showed: (1) That infestations were more concentrated in the timber north and south bordering Blue Canyon; (2) that heaviest

concentrations of infested sugar pines were in the northwest portion of the area from the lower end of Lost Meadow Creek toward Grand Bluff; and (3) that no infestations occurred in cut-over areas. Spotting strategy was therefore changed to include the mapping of infested trees only where the highest timber values were threatened.

The aerial photos and limited ground reconnaissance made prior to the flights showed that the original 4 inch = 1 mile scale map was too inaccurate for aerial mapping purposes. In its place was used another 4 inch = 1 mile scale Forest Service sales appraisal map which indicated greater accuracy of detail.

The mapping of individual trees was undertaken in the second flight, started about 1:30 p.m. This was started in the heavy sugar pine stands lying north and west of Lost Meadow. Aerial strips were flown east and west between the cut-over area east of Lost Meadow and the change in type bordering Blue Canyon. Separate drainage basins were circled. All infested trees, both sugar pine and ponderosa pine, were indicated by appropriate symbols. Estimates of diameter were indicated by a number opposite a given symbol. This flight included all virgin pine areas southward to Nutmeg Saddle, eastward to Bear Meadow creek, and westward to type changes bordering Blue Canyon.

The mapping went well until it was discovered that actual topographic features and those mapped did not jibe, making locations uncertain. This was brought out when the westward direction of Lost Meadow Creek loomed up about 1/2 mile north of its location on the map. From this point the element of uncertainty was apparent until the features mapped and ground features noted from the air were again in agreement.

The third (last) flight, between 4:15 and 5:20 p.m., covered areas lying to the south and east of Nutmeg Saddle, with Jack W. Bongberg on mapping detail. Since the 4-inch = 1 mile scale did not cover this area, a Forest Service 2 inch = 1 mile topographic map was used. This map was more accurate in road locations than the enlarged 4-inch scale since road placements were taken from aerial photos. The principal areas covered by this flight were Fence Meadow, Fence Meadow Point, Lower Bear Meadow Creek, and Oak Flat.

The mapping of infested trees in all areas was done at a height varying from 100 to 200 feet above the forest canopy. The air speed of flight varied between 30 and 35 miles per hour. Prevailing westerly air currents were estimated at 10 to 12 miles per hour. The altitude of flight (5,000 to 6,000 feet) made hovering impossible with the type of aircraft used.

The limited experience provided by this means of spotting gives us a basis upon which to judge its possibilities on future insect control projects. It brought out several very important points of value in the planning and mapping required. These points are discussed separately.

1. An accurate map is essential. The maps available on this detail were much too inaccurate for efficient use. Such a map should be drawn on the basis of an aerial photo mosaic of the areas to be covered, in which essential topographic features, roads, streams, etc., are accurately located. An aerial photo mosaic showing land survey lines and streams and ridges traced out may be fully as satisfactory.

2. Flight courses should follow direction of principal topographic features. Experience was gained in flying across ridges and basins in a given flight strip compared with complete coverage of a single basin at a time from top to bottom. The latter course was much more favorable to keeping oriented and in pin-pointing tree location. In the Fence Meadow area, the principal drainages are north and south. Hence, had the flight course followed these directions throughout the mapping detail, the problem would have been greatly simplified.

3. Speed of flight. Limitations on the craft available at present for this type of work prevent slowing down much less than 30 miles per hour at the elevations used. This speed is too fast for the orientation required for accuracy in mapping. A speed of 15 miles per hour is to be preferred. Hovering was not possible, and this factor would have been advantageous as an orientation factor.

4. Height above tree canopy. All flights were 100 to 200 feet above the tree canopy. This height proved entirely satisfactory for good visibility of infested trees. Safety factors prevented flying closer to the tree tops, but this was not necessary.

5. Ground markers in addition to roads and topographic features are not necessary and are too difficult to observe. Not one of the markers placed on the ground along the Hinkey - Fence Meadow road prior to the flight was seen. The reason was due primarily to the necessity of observing these from a vertical plane. The heavy tree canopy prevented viewing them from an angle. At a speed of 30 to 35 miles per hour, the chances of observing the markers were lessened even more since they were passed over too quickly.

6. Familiarity with an area to be covered is essential to a good job of mapping. In lieu of ground familiarity this can be gained by a thorough study of aerial photos with the aid of a stereo viewer. Even with good ground familiarity of an area, the study of aerial photos is most helpful before flights are made.

7. Good visibility is essential. Visibility conditions on the day of the Fence Meadow flights were excellent, and no difficulty was experienced in spotting infested trees at a distance in line of flight.

8. Good communication between observer and pilot. While not entirely essential, it would be advantageous to carry on communication in directing a flight course without having to shout in the ear of the pilot or observer, as was the case in the flights concluded. In lieu of conversational communication, hand signals could be developed to advantage.

In general, experience in this type of work is essential to the detailed accuracy that is required. With the more powerful craft that are now being built, having a hover ceiling around 8,000 feet elevation, much of the desirable features now lacking in the present day helicopter will be incorporated and will be distinctly advantageous in this type of work.

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